Fiscal policy and the Ricardian equivalence: Empirical evidence from Morocco

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Abstract. This paper empirically investigates the validity of the Ricardian equivalence hypothesis in Morocco, based on recent data (1980-2016) that encompasses interesting episodes of demand-oriented expansionary government policy during the second half of the 2000s, followed by significant restrictive fiscal measures starting from 2012. We use the SVAR methodology, which enables us to make the difference between the dynamics of savings and the budget deficit by separating them into two types of shocks. Our results suggest that the equivalence is verified in the Moroccan macroeconomic framework. The paper concludes that national savings offset up to 76% of fiscal deficit shocks.

Keywords. Fiscal deficit, National savings, Ricardian equivalence, SVAR model.

JEL. H31, E21, E62.

1. Introduction

In the aftermath of the 2008 financial crisis, fiscal deficits have drastically increased in a large number of countries, as their public income and expenditures have ceased to evolve in the same pace. This budgetary crisis was first observed in several advanced economies, e.g. Greece, Portugal, Spain, France and the United States. Nonetheless, a second-round effect was driven on many developing countries, such as Morocco. The latter was bound to fiscally support the domestic demand in order to compensate the significant drop in exports, as the foreign demand regressed because of the recession from which many European countries suffered. This phenomenon was followed by a substantial rise in the public debt, in advanced economies as well as developing ones.

Despite the gradual improvement that characterised budget deficits in both advanced and developing countries mostly as a consequence of draconian austerity measures, the problem of public debt is likely to persist in the medium term given the significant financial needs and the scarcity of additional public revenue. This trend is confirmed in the Moroccan framework, where the government's debt went from a level of 45.4% of GDP in 2008 to 64% in 2016. As a consequence, it is merely logical to think of what would be the economic behaviour of households when coming up against such rise in public debt. In this framework, the notion of Ricardian equivalence is important when examining the potential mechanisms that link fiscal policy to household consumption and savings. Basically, this theorem states that households, being aware that higher levels of government debt in the current period will result in higher taxes in the future, tend to save accordingly. The

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present value of future savings (based on a given discount rate) would completely compensate for the deficit, so that the substitution of the debt for taxation does not affect the wealth of the private sector (Descamps, & Page, 1994). Consumption would remain unchanged, which contradicts the Keynesian theory which argues that an increase in the public deficit would drive an upward influence on aggregate demand. In a nutshell, fiscal policy's macroeconomic effectiveness is, to a significant extent, tributary to whether it is the rule-of-thumb households that are dominant in the economy or the Ricardian ones.

It is worth bearing in mind that, for the principle of equivalence to be valid, the intergenerational transfer mechanisms must be *operative*, in the sense that individuals must actually plan to leave a positive legacy to their descendants. Also, in order for households to be Ricardian, they need to decide their consumption based on their permanent income, which depends on the present value of wages, after tax deduction. Thus, the discounted value of expected future taxes by said households would be exactly equal to the present drop in taxes or the present increase in public spending. In other terms, households must be forward-looking and abide by the hypothesis of rational expectations.

The macroeconomic repercussions of public debt have been subject to theoretical and empirical controversies. Before the seminal work of Barro (1974), Bowen *et al.* (1960) argued that despite the fact that consumption tends to regress when public borrowing increases, economists should not evaluate the sacrifices of a generation based on their refusal to consume at a specific time. On the contrary, the debt burden borne by a generation can also be interpreted as a deprivation of total private consumption by that generation during its lifetime (Bowen, Davis, & Kopf, 1960).

On the empirical level, several studies indirectly refute the validity of the Ricardian equivalence hypothesis. The studies made by Feldstein (1982) and Modigliani & Sterling (1990) suggest that aggregate consumption reacts to both public debt and tax levels. Furthermore, Wilcox (1989) discovered that due to changes in taxation and transfers, households do not appear to be perfectly smoothed over time. Haug (2017) rejected the Ricardian equivalence for the case of New Zealand, using a different methodology, i.e. a narrative measure of discretionary fiscal policy measures and tax shocks from 1945 to 2008. In the same logic, Adji & Alm (2016) use a battery of time series tests on the effects of government debt finance in Indonesia from 1972 to 2003. Their estimation results *consistently* and *strongly* reject the predictions of the Ricardian paradigm.

On the other hand, other studies provided empirical evidence in favour of the equivalence hypothesis. The results of Afzal (2012) suggest the validity of said hypothesis in the case of Pakistan for the period from 1960 to 2009. In this frame, Afzal (*ibid.*) uses cointegration, VAR and the Granger causality test; a particular attention was given to examining the time series properties in order to avoid the criticism made against several previous studies such as Kormendi (1983) and Aschauer (1985), namely model-specification, simultaneity bias and data stationarity. Ghassan (2007) estimates a structural vector auto-regressive approach (SVAR) to test the Ricardian equivalence hypothesis in Morocco using data from 1970 to 2001. He separates the co-movements of saving rate and budget deficit rate into two shocks, and avoids imposing formal short and long run constraints, as they could lead to an overestimation of the compensation rate, thereby biasing the estimation of structural multipliers. His results suggest that the equivalence hypothesis is applicable to the Moroccan economy, since private saving compensates around 90% of budget deficit shocks.

In the present research paper, we provide empirical evidence regarding the Ricardian equivalence hypothesis in Morocco, based on recent data (1980-2016) that encompasses interesting episodes of expansionary fiscal policy during the second half of the 2000s, followed by significant restrictive fiscal measures. We use the SVAR methodology, which enables us to make the difference between the dynamics of savings and the budget deficit by separating them into two types of

shocks; each type is related to the structural multiplier associated with each of the two variables. In order to avoid model over-specification and to increase the credibility of the estimates and tests, we do not assume short or long term constraints.

2. Insights on the Moroccan framework

Before proceeding to an empirical examination of the Ricardian equivalence hypothesis in Morocco, it is important to provide some elements of context regarding the evolution and current state of the two variables of interest.

2.1. The budget deficit: History and current state

From the country's independence in 1956 until mid-1970s, the public deficit had been evolving in a relatively stable pattern, as the overall public finance followed the evolution of the economy. The massive investment spending that marked the 1973-1977 five-year plan drastically changed this evolution. Said plan focused on infrastructure projects such as dams and national roads, besides from attempting to support the national industry and its exports through import substitution industrialisation policies.

This plan required tremendous funds and the government made a massive use of foreign debt, which pushed the deficit to an unprecedented level in the early 1980s, despite the government's efforts to stabilise its budgetary situation during the period from 1978 to 1982. As the country was threatened with a cease-of-payment, rescheduling foreign debt was unavoidable. And in order to consolidate the public finance and stem budget deficits, the government initiated a restrictive budgetary cycle from 1983 to 1992, i.e. the Structural Adjustment Plan -SAP- (*Plan d'ajustement structurel*). The budget deficit, which represented 9.2% of GDP in 1983, gradually regressed to 2.2% of GDP in 1992 (Haut-Commissariat au Plan -HCP-, 2008).

In the adjustment process, the structure of fiscal deficits financing has also changed considerably. Instead of foreign borrowing, domestic sources of financing have gradually taken a relatively large share since the implementation of the SAP, covering on average 45.5% of budget deficits between 1983-1992 (Ministère de l'Economie et des Finances du Maroc., 2006). The period 1993-2004 was characterised by relatively well-controlled deficits, but this control remained fragile. Starting from 1993, the government relied on privatisation revenues to reduce its budget deficits down to sustainable levels. As a result of this exceptional source of public revenues, the budget deficit declined to an average of 3.1% of GDP over the period 1996-2003, compared to 3.3% between 1990 and 1995 (Haut-Commissariat au Plan -HCP-, 2008). By way of example, the deficit was reduced in 2001 to 2.6% of GDP, thanks to the proceeds from the sale of 35% of the Maroc Telecom's capital.

From 2003 to 2010, the Moroccan government managed to maintain budget deficits at an average of 2.3%. However, in the wake of the social and political tensions that marked the MENA region in 2011, the government launched large demand-oriented government spending sprees. This led to substantial fiscal deficit rates in both 2011 and 2012, reaching respectively 6.2% and 7.1% of current GDP. Afterwards, the restrictive fiscal policy led by the government brought down the deficit to 5.4% in 2013 and 4.9% in 2014. The deficit rate continued to decrease in 2015 and 2016, respectively at 4.4% and 4%, with an expected 3.5% rate in 2017. Evidently, the reduction of fiscal deficits has been at the expense of government spending this time, particularly investment expenditures, hence the most likely downward influence on the purchase power of economic agents and on the aggregate demand in general.

2.2. The evolution of the gross national saving

Two main features have characterised the evolution of national savings in Morocco since the implementation of the financial liberation in Morocco: on the

one hand, instability in the growth of this aggregate and, on the other hand, a partial coverage of investment.

Regarding the first feature, after having registered a low level at 19.62% of GDP due in particular to the financial crisis that affected Morocco in the early 1980s, the national saving rate has recovered starting from 1984, the date of the beginning of a cycle of relatively continuous growth.

This gradual increase has been tributary to the financial liberalisation measures taken by the Moroccan authorities under the SAP. The aim of these measures was to encourage the formation and mobilisation of national savings, regulate the demand, diversify savings instruments and above all, to maintain encouraging remuneration conditions in order to motivate private savings.

It is worth mentioning that at the first half of the 1990s, this evolution has considerably lost momentum and the gross national saving rate has steadily declined from one year to the next, reaching only 20.70% of GDP in 1995. The only exception was in 1992 when it reached 24.82% as a result of an increase in net incomes received from abroad, which amounted to 11.9 billion MAD. The fluctuations in the agricultural sector, which are highly tributary to the arbitrary yearly levels of rainfall, have also driven a significant influence on national savings. From 1995 to 1996, the latter fell from 68 billion MAD to 65 billion as a consequence of the fall in agricultural output during that year. Since then, gross national saving has been evolving at an upward trend, reaching 26.6% of GDP in 2013 and 28.3% in 2016.

A significant part of the evolution in national savings coincided, on the one hand, with the strict austerity policy measures launched by the Moroccan government in order to reduce capital expenditure and, on the other hand, with the implementation of a structural liberalisation reform aimed at increasing national savings by stimulating its public and private components (Bank Al-Maghrib, 1998).

In light of these observations, it could be inferred that the most effective way of increasing national savings in Morocco is through the simultaneous implementation of: 1) a policy of public finance consolidation, which would lead to public savings, and 2) a policy of financial liberalisation that would encourage saving in the private sector.

In fact, the examination of the evolution of national savings in Morocco throughout the financial liberalisation carried out since the beginning of the 1980s, revealed that this aggregate has indeed substantially improved, going from 18 billion MAD in 1980 to 278 billion in 2015. Nevertheless, this growth has been unstable over time, reflecting an irregular effort of saving.

3. Emprical examination of the Ricardian equivalence

In this paper, we use annual data covering the period from 1980 to 2016. The main variables are GDP, the gross national saving (S) and the budget deficit (D). All are expressed in real terms. GDP and savings statistics are derived from the High Commission for Plan database (*Haut-Commissariat au Plan*, i.e. the Moroccan national statistics institution), while the budget deficit statistics are taken from the Ministry of Finance.

3.1. The stationarity of the data

In this study, we use the augmented Dickey-Fuller unit root test, confirmed by Phillips-Perron's. According to the tests, the two variables S and D are not stationary and contain a unit root. The values of the Dickey-Fuller and Phillips-Perron statistics on level variables are higher than the critical values at both the 1% and 5% thresholds.

Table 1. *The Augmented Dickey-Fuller test results*

	With trend and interceipt	Critical value	With interceipt	Critical value	None	Critical value
TD	-2.817642	-3.574244	-2.028280	-2.967767	-2.973364	-1.953381
ΔTD	-8.943871	-3.580623	-8.728459	-2.971853	-8.313898	-1.953381
TS	-2.588477	-3.574244	-1.117048	-2.967767	-0.629970	-1.952910
ΔTS	-7.073405	-3.580623	-7.268847	-2.971853	-6.979995	-1.953381

Source: Authors' calculations.

Table 2. *The Phillips-Perron test results*

	With trend and interceipt	Critical value	With interceipt	Critical value	None	Critical value
TD	-2.817642	-3.574244	-1.765336	-2.967767	-1.929977	-1.952910
ΔTD	-8.943871	-3.580623	-8.728459	-2.971853	-8.313898	-1.953381
TS	-2.622271	-3.574244	-1.117048	-2.967767	-0.842776	-1.952910
ΔTS	-7.073405	-3.580623	-7.268847	-2.971853	-6.979995	-1.953381

Source: Authors' calculations.

According to both tests, the unit root hypothesis cannot be rejected. The variables are stationary in first difference, however, and the statistics values become lower than the critical values at the 5% threshold. This means that the two series are integrated in first order I (1).

Applying the Johansen test to the series shows that the two series are not co-integrated at the 5% threshold, based on both the trace statistic and the max-eigenvalue statistic.

Table 3. *The Results of the Johansen tests for cointegration*

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.262272	9.093769	15.49471	0.3568
At most 1	0.020386	0.576719	3.841466	0.4476

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.262272	8.517050	14.26460	0.3286
At most 1	0.020386	0.020386	3.841466	0.4476

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Based on these results, it is possible to conclude that there is no long-term equilibrium relationship between the gross national saving and the public deficit. But this does not necessarily mean that in the short term there is no causal relationship between the two variables.

3.2. The instantaneous Granger causality test

The coefficients are not significantly different from zero [1]. However, the elements discussed so far suggest that VAR modelling is appropriate and that innovations do not have permanent effects on both variables. This model summarizes the different correlations between the two series and could be considered as a reduced form of the structural model that remains to be determined.

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[1] The Granger causality test allows us to accept, at the tolerance threshold of 5%, the null hypothesis of the existence of a cause-and-effect relationship between the public deficit and the gross national saving. The sense of causality indicates that the deficit causes savings.

Table 4. *The results of the instantaneous causality test*

	Constant	Δ TS	Δ TD	Δ TD(-1)	Δ TS(-1)
ΔTD	0.003502355764	0.1884049337	-	0.4226568518	0.1926777033
ΔTS	-0.004886229704	-	0.2379927836	- 0.2783101872	0.2234585392

3.3. The SVAR model

The general VAR form in first difference is as follows:

$$\Delta d_t = f_1(\Delta d_{t-1}, \Delta s_t, \Delta s_{t-1}) + v_{dt}$$
$$\Delta s_t = f_2(\Delta d_{t-1}, \Delta s_t, \Delta s_{t-1}) + v_{st}$$
(1)

With: Δd_t being the public deficit rate, Δs_t the saving rate and v the vector of structural innovations.

The reduced form of the structural VAR can be written in the following way:

$$\begin{cases} \Delta d_1 = c_1 + \alpha_{11}\Delta d_{t-1} + \alpha_{12}\Delta s_{t-1} + \varepsilon_{dt} \\ \Delta s_1 = c_2 + \alpha_{21}\Delta s_{t-1} + \alpha_{22}\Delta d_{t-1} + \varepsilon_{st} \end{cases}$$
(2)

The error variance is given by:

$$V(\varepsilon_t) = \begin{bmatrix} \sigma_d^2 & \sigma_d\sigma_s \\ \sigma_d\sigma_s & \sigma_s^2 \end{bmatrix}$$

3.4. Discussion of the results

Following the estimation of our model, we obtain the following system:

$$\Delta td_t = -0.004630576013 - 0.4973945455^*\Delta td_{t-1} - 0.1576456894^*\Delta ts_{t-1}$$
$$\Delta ts_t = 0.005988273379 + 0.3966864996^*\Delta td_{t-1} - 0.1859400028^*\Delta ts_{t-1}$$

The optimal lag of this VAR model is one (1) period, considering the four information criteria, i.e. Akaike, Schwarz, FPE and HQ. Moreover, the canonical VAR (1) is stationary, and the residuals seem to be actually auto-correlated, according to the Breusch-Godfrey LM test and the Portmanteau autocorrelation test. These elements suggest that the residual orthogonalization and SVAR modelling are the most appropriate for this very case.

The variance-covariance matrix of residuals is as follows:

$$C = \begin{pmatrix} 0,01599366 & -6,08779E-05 \\ -6,08779E-05 & 0,01797561 \end{pmatrix}$$

This matrix is not diagonal, and the correlation between the two calculated residuals is not equal to zero. The value of said correlation's coefficient, which measures the instantaneous causality between the budget deficit and the gross national saving, can be obtained through the covariance, which is equal to -0.2117 in the present case. As a consequence, considering the estimated VAR as a simulation model, when a shock occurs in one of the two disturbances, it is necessary to modify the other one.

The error terms ε_{dt} and ε_{st} in equation (2), represent reduced-form innovations that have no economic interpretation. Their signification is merely statistical. The main issue is to be able to switch from the effects of this type of shocks toward the effects of structural shocks, which could be interpreted economically. In order to do so, we will use economic theory by assuming that the reduced-form innovations are a linear combination of structural fiscal and savings shocks.

Short-term identification restrictions need to be considered when proceeding to residuals factorisation. In this case, n = 2; to identify the n² parameters of the

equation, we must impose n.(n-1)/2 constraints, i.e. 1 constraint. As a matter of fact, we consider one short-term restriction because the response to a savings innovation does not have a short-term effect on the budget deficit. Hence, the matrix M would be triangular in order to encompass this constraint, so that the system is just identifiable. We obtained the following factorisation:

$$M = \begin{pmatrix} 1 & 0 \\ -0.762 & 1 \end{pmatrix}$$

3.5. The forecast error variance decomposition

The variance decomposition is intended to calculate the contribution of each innovation to the variance of the error. It is possible to mathematically write the forecast error variance to a given horizon h as a function of the error variance attributed to each of the variables. Then, we would only need to relate each variance to the total variance in order to come up with its relative weight in percentage (Bourbonnais, 2004).

In the present case, the variance decomposition suggests that the error variance of the budget deficit is explained at 97% by its own innovations, while those related to gross national saving have an explanatory power of 3%. As regards to the error variance of gross national saving, 19% of its dynamics is explained by budget deficit shocks and 81% by the gross national saving's. This observation is confirmed by the dynamic multiplier of the matrix M since it is equal to -0.762007, which confirms the existence of the Ricardian equivalence in Morocco's public finance. This multiplier indicates that when a shock is driven on the budget deficit, 76% of its effect is offset by national savings.

After a fiscal shock (see Figure 1), represented by an increase in the public deficit, the SVAR model detects for the following year a policy that could be qualified as restrictive, since during this second year there is a deficit rate below the equilibrium level. However, fiscal authorities tend to adjust the budget balance, in a countercyclical and gradual pattern until it reaches its initial level by the fifth period of time. This is consistent with the fact that an expansionary fiscal policy is generally followed by restrictive measures so as to stem potential budgetary imbalances. The European contemporaneous fiscal history corroborates and illustrates this rule-of-thumb; the European governments, after having bailed out their financial and economic sectors after the 2008 financial crisis, switched to tightening their belts through austerity measures, just a year later.

As for national savings, it is positively correlated with the budget deficit in the sense that economic agents do react, if considered a one-period lag. This finding is based on the nature of expectations in the Moroccan economy, which is dominated by the backward-looking component compared to the rational one, as revealed by Oukhallou & Mrabti (2017). Furthermore, economic agents are less likely to perceive the notion of deficit as opposed to that of expected taxes, especially when considering that the latter are declared in the yearly finance bills. Finance bills are voted by the parliament within the three last months before the financial year in question, which means that non-financial agents would hypothetically start saving at the end of the first year and the beginning of the second year –which is concerned by the finance bill and its potential changes in taxation. The annual periodicity of our model obviously does not allow for assessing the existence of this particular intra-annual behavioural aspect. An additional argument, confirming all the more that the gross national saving reacts with a one-year lag, would be the fact that it joins the stationary state only a period (the 6th year) after the public deficit has returned to its equilibrium level (the 5th year).

4. Concluding Remarks

This research paper empirically examines the Ricardian equivalence hypothesis in the Moroccan economic framework, by assessing the relationship between fiscal deficits and national savings.

The importance of this examination comes from the fact that the macroeconomic effectiveness of fiscal policy is significantly affected by the dominant behaviour among households. In the case of rule-of-thumb households, an increase in the public deficit is most likely to drive an upward influence on aggregate demand, thereby supporting economic growth. On the other hand, when Ricardian households are dominant, consumption supposedly remains unchanged, as economic agents tend to save for future tax increases or public budget cuts instead of purchasing goods and services.

In this process, we use a Structural Vector Autoregressive (SVAR) model; the latter has enabled us to make allowances between the dynamics of savings and the budget deficit by separating them into two types of shocks. And our results support the existence of the Ricardian equivalence in Morocco. The model suggests that the gross national saving offsets up to 76% of the increase in the fiscal deficit rate. This finding could be considered to some extent as a problem, since it insinuates that fiscal policy and government deficit spending measures are not likely to have a significant impact on GDP through the aggregate demand.

As regards to the question of fiscal policy effectiveness, particularly when it comes to public investment spending, it seems important to consider the Ricardian equivalence alongside the rules-of-thumb developed by Oukhallou (2016), which aim to guide policy makers in the shaping of an effective public spending policy.

Appendix

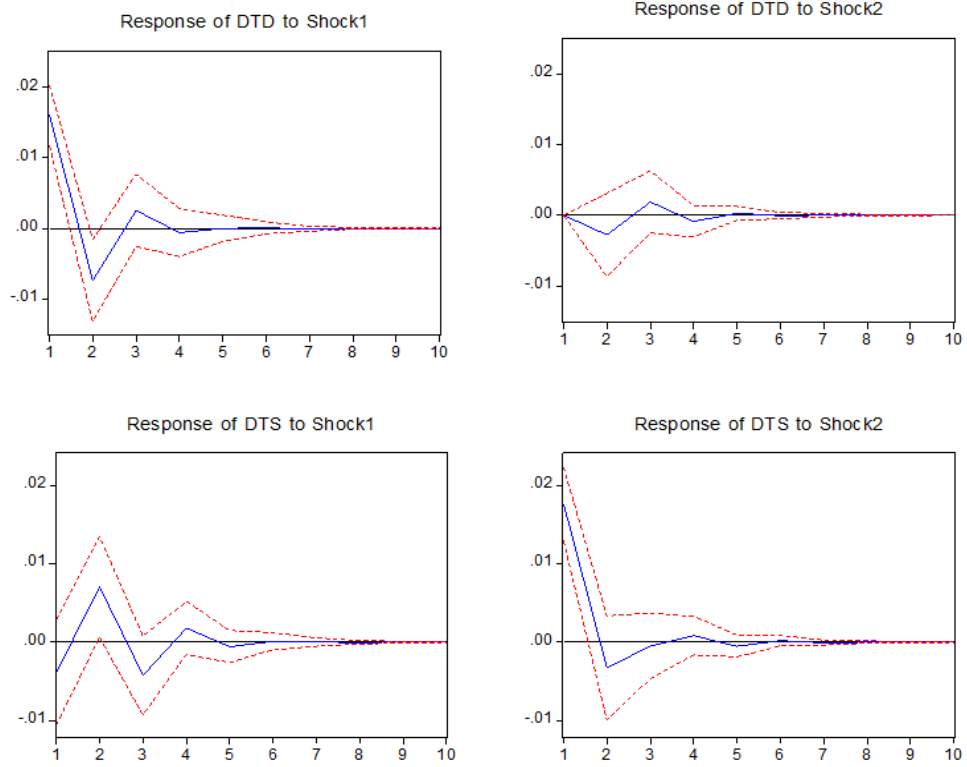Response to Structural One S.D. Innovations ± 2 S.E.

Figure 1. *The variables' impulse response to structural public deficit and savings shocks*

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